Wildfire at the Urban Interface: Protecting Children's Health in an Era of Growing Firestorms

Sarah Ann Keil Heinonen, DNP, APRN, CPNP-AC/PC [a]
Beth A. Smith, PT, DPT, PhD[b]
Derek Corpus, MBBS[c]
Christopher Landon, MD[d]

Introduction

Over the past decade, California has endured some of the most devastating wildfire seasons in its recorded history. The destruction is measured not only in acres burned and homes destroyed, but also in the invisible toll of smoke inhalation, displacement, and toxic exposure[1,2]—effects of which weigh heavily on children.

Nowhere is this crisis more acutely felt than in the wildland–urban interface (WUI), the zones where housing developments, schools, and childcare centers intermingle with chaparral, forests, and fire-prone landscapes. Families in Los Angeles, Ventura, San Bernardino, and surrounding counties have repeatedly faced evacuations, days of hazardous smoke, and months of uncertainty as flames threatened their neighborhoods.

For pediatric healthcare providers in Southern California, wildfires represent not only an environmental disaster but also a pressing child health issue. The American Academy of Pediatrics (AAP) has long emphasized children's unique vulnerability to air pollution, toxins, and displacement. With wildfires growing more frequent and intense, and with housing developments expanding further into fire-prone areas, more children are now living on the frontlines of fire risk than ever before.[2,3]

Children, A Uniquely Vulnerable Population

Children are more susceptible to the effects of wildfire smoke and toxic exposures due to their developing lungs, higher minute ventilation and time spent outdoors. Physiologically, children breathe more air per pound of body weight than adults, which means that on smoky days, their proportionate exposure to fine particulate matter and airborne chemicals is far greater.[3,4] Their ongoing lung and brain development leaves them especially susceptible to inflammatory injury and the effects of neurotoxins.[3,4] These early exposures can alter the trajectory of lung growth, setting the stage for chronic disease later in life and may also contribute to neurodevelopmental and behavioral challenges.[3,4]

Behavior and dependence amplify these risks. Children are more likely to remain outdoors even during poor air quality and are less able to perceive or avoid hazards. They rely on caregivers to make protective decisions such as staying indoors, using well-fitted respirators, or evacuating during dangerous conditions. Alarmingly, studies suggest wildfire smoke may be up to ten times more harmful to children younger than five—a population particularly vulnerable to severe outcomes. Research consistently demonstrates that for children with asthma, the threat is even

greater: wildfire smoke consistently worsens asthma control, driving increased use of rescue medications, emergency department visits, and hospitalizations.[1,3,4,5-7]

These risks are not equally distributed. Children living in poverty, minority, or Indigenous communities, rural or wood-burning households, crowded housing, or those with limited access to healthcare face the greatest risk. These social drivers of health such as poverty, housing instability, and limited medical access both intensify exposure and reduce the ability to respond effectively. Families without reliable air filtration, safe evacuation options, or consistent healthcare cannot easily protect their children, compounding respiratory risk and reinforcing health inequities.[2,7,8]

December Conference Preview

Recognizing the accelerating threats of wildfire and wildland-urban interface (WUI) exposures and the associated challenges, the upcoming transdisciplinary conference to be held, *Saturday, December 13, 2025 from 8am to 2pm* at **Children's Hospital Los Angeles** (CHLA) presented by the **Pediatric Firestorm TEAM** and **Best Starts to Life; *"Pediatric Health on a Burning Planet; Assessment, Action, and Advocacy"*** will bring together experts across the fields of medicine, science, engineering, community, and advocacy. Experts will discuss current and projected outcomes related to planetary, environmental and human health changes. Pediatric pulmonologists will share emerging data on wildfire-related lung injury and the long-term trajectories of children with asthma. Environmental scientists will present research on toxins in wildfire ash and soil, while child psychologists will address trauma-informed care for displaced and affected children and community leaders from California will highlight strategies both schools and clinics are using to build resilience. This exciting workshop will be formatted to engage attendees in focus groups for solution driven discussions with actionable outcomes.

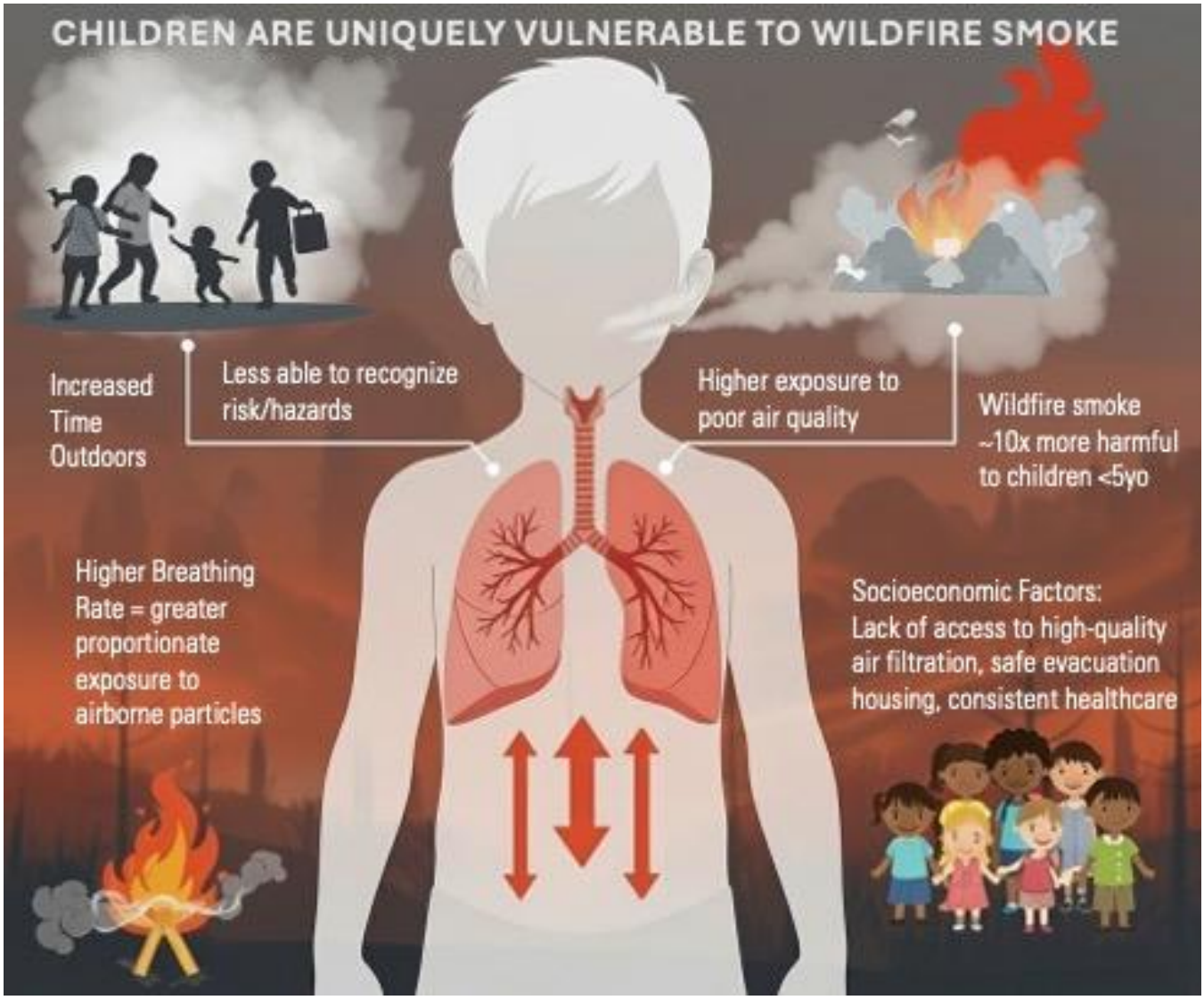
Practical Guidance and Resources for Pediatricians

While research continues to evolve, there are already evidence-informed steps pediatricians can take. Screening questions during routine visits—such as asking whether families have been affected by wildfire smoke or evacuation—can open the door to important conversations. Every child with asthma should have an updated written asthma action plan before fire season begins.[1] Clinicians should encourage families to designate a "clean room" in their home equipped with a HEPA filters[6-7] and should normalize referrals to counseling for children showing signs of distress.

Mitigation strategies also include practical steps families can implement; staying indoors during high smoke days[7], using HEPA filters to improve air quality, and wearing N95 respirators when outdoor exposure cannot be avoided.[6] Ensuring hydration is a simple but valuable tool, as it helps maintain mucosal moisture and supports clearance of inhaled irritants.[5]

For community-level support, pediatricians can direct families to established resources. **The AAP Disaster Preparedness** website offers pediatric-specific guidance, while the **CDC Wildfire Smoke & Health Toolkit** provides accessible handouts. The **EPA AirNow Fire** and **Smoke Map** offers real-time air quality information for decision-making. California's Office of Emergency Services also provides region-specific evacuation and relief resources.

At the advocacy level, pediatricians can play a powerful role in advancing structural changes. Investments in school air filtration systems and clean-air shelters, policies promoting fire-resilient housing, and expanded access to mental health services in affected communities are priorities that directly influence children's safety and well-being.[6-7]



References

1. Balmes JR, Holm SM. Increasing wildfire smoke from the climate crisis: Impacts on asthma and allergies. *J Allergy Clin Immunol.* 2023;152(5):1081-1083. doi: 10.1016/j.jaci.2023.09.008

2. Morejón-Jaramillo PE, Nassikas NJ, Rice MB. Clinical medicine and climate change. *Immunol Allergy Clin North Am.* 2024;44(1):109-117. doi: 10.1016/j.iac.2023.07.006

3. Andersen ZJ, Vicedo-Cabrera AM, Hoffmann B, Melén E. Climate change and respiratory disease: clinical guidance for healthcare professionals. *Breathe (Sheff).* 2023;19(2):220222. doi:10.1183/20734735.0222-2022

4. McDonald VM, Archbold G, Beyene T, et al. Asthma and landscape fire smoke: A Thoracic Society of Australia and New Zealand position statement. *Respirology.* 2023;28(11):1023-1035. doi:10.1111/resp.14593

5. Aguilera R, Corringham T, Gershunov A, Leibel S, Benmarhnia T. Fine particles in wildfire smoke and pediatric respiratory health in California. *Pediatrics.* 2021;147(4):e2020027128. doi:10.1542/peds.2020-027128

6. Adibi A, Barn P, Shellington EM, Harvard S, Johnson KM, Carlsten C. High-efficiency particulate air filters for preventing wildfire-related asthma complications: A cost-effectiveness study. *Am J Respir Crit Care Med.* 2024;209(2):175-184. doi:10.1164/rccm.202307-1205OC

7. Lipner EM, O'Dell K, Brey SJ, et al. The Associations Between Clinical Respiratory Outcomes and Ambient Wildfire Smoke Exposure Among Pediatric Asthma Patients at National Jewish Health, 2012-2015. *Geohealth*. 2019;3(6):146-159. Published 2019 Jun 3. doi:10.1029/2018GH000142

8. Vargo J, Lappe B, Mirabelli MC, Conlon KC. Social Vulnerability in US Communities Affected by Wildfire Smoke, 2011 to 2021. Am J Public Health

Web Resources

The AAP Disaster Preparedness website. https://www.aap.org/en/patient-care/disasters-and-children/professional-resources-for-disaster-preparedness Accessed September 3, 2025.

Centers for Disease Control and Prevention. Wildfire Smoke & Health. CDC.gov. https://www.cdc.gov/wildfires/risk-factors Accessed September 3, 2025.

US Environmental Protection Agency. Air Cleaners and Air Filters in the Home. EPA.gov. https://www.epa.gov/indoor-air-quality-iaq/air-cleaners-and-air-filters-home Accessed September 3, 2025

Authors

Sarah Ann Keil Heinonen, DNP, APRN, CPNP-AC/PC [corresponding author][a]
Beth A. Smith, PT, DPT, PhD[b]
Derek Corpus, MBBS[c]
Christopher Landon, MD[d]

[a] Division of Pediatric Pulmonology & Sleep Medicine
4650 Sunset Blvd., Mailstop #83
Children's Hospital Los Angeles
Los Angeles, CA 90027 USA
sheinonen@chla.usc.edu

[b] Developmental Neuroscience and Neurogenetics Program, The Saban Research Institute
Division of Developmental-Behavioral Pediatrics, Children's Hospital Los Angeles
Department of Pediatrics, Keck School of Medicine, University of Southern California
office: Smith Research Tower, 101-D (CHLA Sunset Campus)
mail: 4650 Sunset Blvd. (MS #183),
Los Angeles, CA 90027
bsmith@chla.usc.edu

[c] Department of Pediatrics
Guerin Children's
Cedars Sinai Health Sciences University
116 N Robertson Blvd Suite 700
Los Angeles CA 90048
derek.corpus@cshs.org

[d] Ventura County Medical Center
Mid Coastal CCS Cystic Fibrosis and Pulmonary Diseases Center
Chris.Landon@venturacounty.gov